## Space Weather Forecast

Issued on Monday, 10 July 2023 at 13:15 Local

**This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: G1/Minor Storm likely, chance of G2/Moderate Storm on 12-13 July with CME arrival. Chance of R1/R2 Radio Blackouts throughout.**

**Analysis of Space Weather Activity over past 24 hours**
**Solar Activity:** Solar activity has been Moderate, with a Moderate-class flare peaking at 10/0355 UTC from the complex of sunspot regions in the southwest. There are currently ten active regions on the visible disc. A region in the northwest is the most magnetically complex region. The largest region is in the southeast, but has lost its weak trailing spot so is now one large unipolar spot. There are three regions all close together in the southwest, with some magnetic interaction between these regions, likely increasing instability. A region near north centre disc continues to evolve, but doesn't have any obvious significant complexity at the moment. A new region on the southeast limb is not yet fully visible. The other regions appear to be small and simple at present.
A partial halo Coronal Mass Ejection (CME) associated with the Moderate-class flare was seen travelling towards the southwest in coronagraph imagery. Evaluation is still ongoing, but an Earth directed component is considered probable.

**Solar Wind / Geomagnetic Activity:** The solar wind was at slow levels throughout. Wind speeds varied between 330-390 km/s. Total magnetic field strength has been weak throughout, whilst the north-south component also varied weakly. Geomagnetic activity has been at Quiet levels throughout (Kp 0-2).

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed, although levels of energetic particles were raised very slightly above the normal background.

**Four-Day Space Weather Forecast Summary**
**Solar Activity:** Low to Moderate solar activity is most likely through the period, with a slight chance of an isolated Strong flare.

**Solar Wind / Geomagnetic Activity:** A partial halo CME associated with the Moderate-class flare at 10/0355 UTC was seen travelling towards the southwest in coronagraph imagery. Evaluation is still ongoing, but an Earth directed shock component is considered probable. At this stage, an arrival time of around 13/0000 UTC is most likely, but confidence is low. The solar wind is currently at slow levels and is likely to remain that way until the CME arrival. As the CME effects continue, a coronal hole fast wind is likely to arrive during Day 4 (13 July). The combination of CME effects and fast wind could lead to increased geomagnetic impacts. Geomagnetic activity is forecast to be Quiet to Unsettled at first, increasing to Active to G1/Minor Storm with a chance of G2/Moderate Storm due to CME and fast wind effects on Days 3 or 4 (12-13 July).

**Energetic Particles / Solar Radiation:** Solar radiation has a slight chance of reaching the S1/Minor Storm threshold through the period, should a larger flare occur.

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**Geomagnetic Storms:**

| Geo-Magnetic Storm Probability (Exceedance) | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Minor or Moderate | G1 to G2 | No | 1 | 1 | 30 | 60 |
| Strong | G3 | No | 1 | 1 | 5 | 10 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

**Radio Blackouts - X Ray Flares:**

| X Ray Flares Probability | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | R1-R2 M Class | No | 50 | 50 | 60 | 60 |
| Very Active | R3 to R5 X | No | 10 | 10 | 10 | 10 |

**Solar Radiation Storms - (High Energy Protons):**

| Radiation Storms Probability (Exceedance) | Level ($cm^{-2}$ $sr^{-1}$ $s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) (%) | Day 2 (00-24 UTC) (%) | Day 3 (00-24 UTC) (%) | Day 4 (00-24 UTC) (%) |
|---|---|---|---|---|---|---|
| Active | ≥ S1 | No | 10 | 10 | 10 | 10 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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